GROUND WATER PROBABILITY MAP

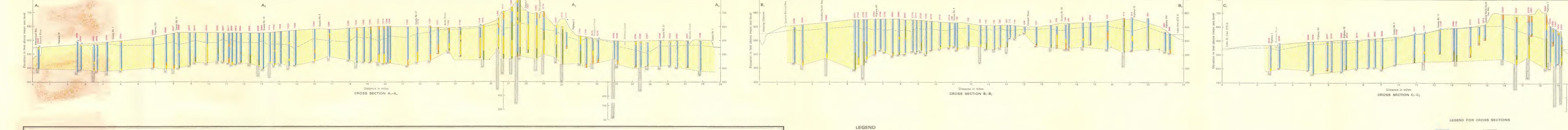
This map was compiled by the Hydrologic Data Branch of the Commission's Division of Water Resources.

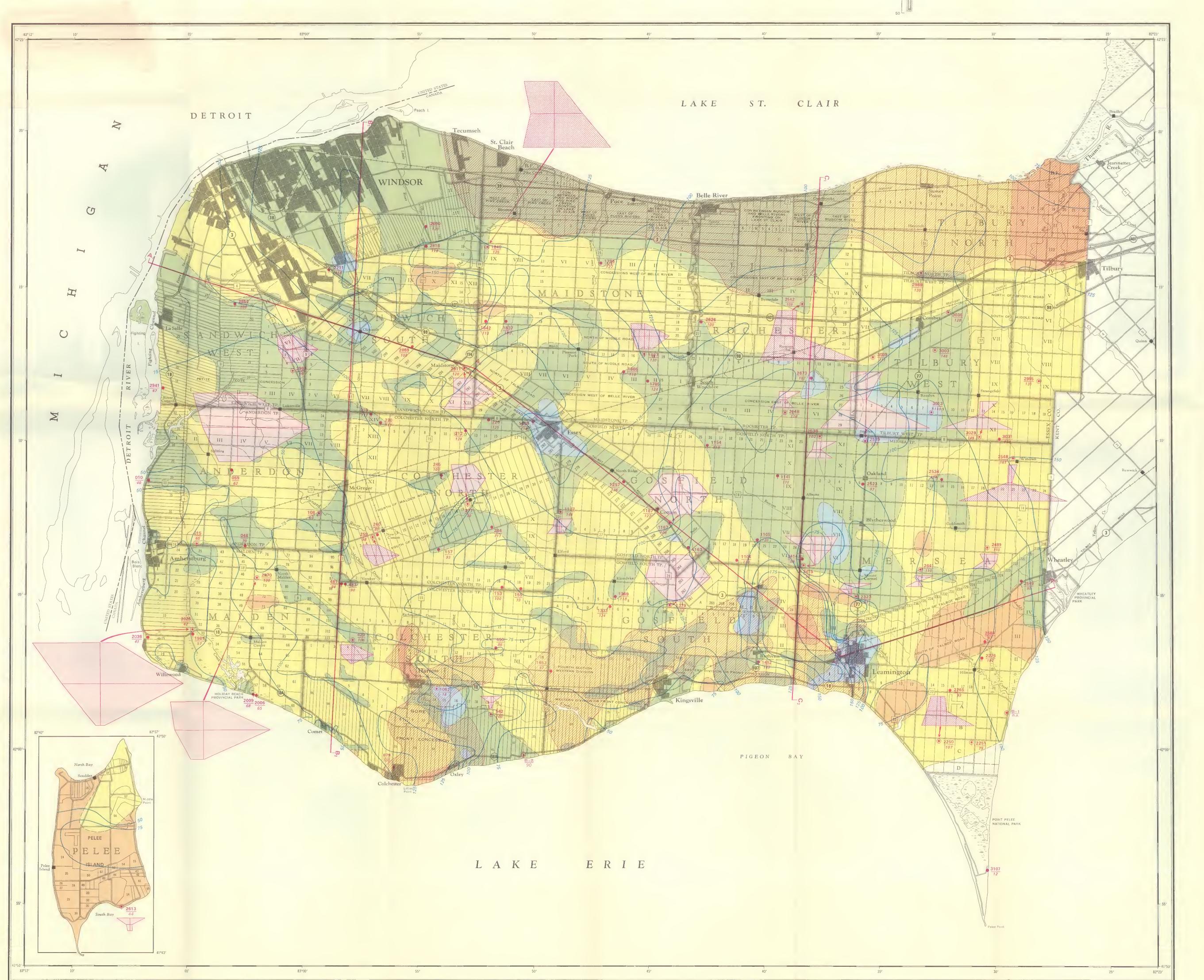
ONTARIO WATER RESOURCES COMMISSION

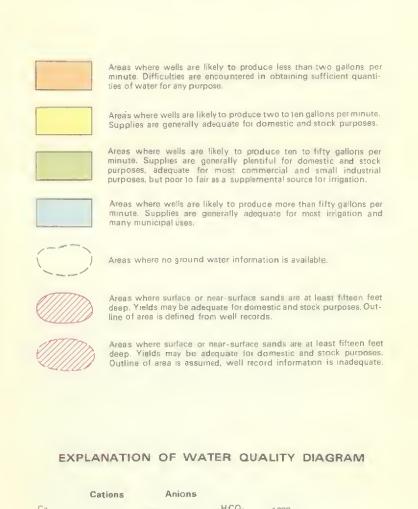
135 St. Clair Avenue West Toronto 195, Ontario

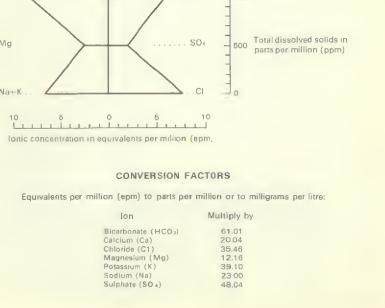
1971

Published 1971









SYMBOLS

Bedrock well with field analysis.....

Overburden well with laboratory analysis. . . .

Bedrock well with laboratory analysis . . .

Overburden well with field analysis.....

BIOCK Well Will Held dilaysis
mple and well number
mple and well number
ater quality diagrams:
ncentrations to scale
ncentration scales reduced; multiply scaled values by five
pographic symbols:
Itilane, limited access highway
vincial highway
unty road
ner road
lway
ennial river or stream
rmittent stream
rsh or swamp.
ernational boundary.
unty boundary
vnship boundary
, town or village limit
ncession line
line
k or reserve boundary
lt-up area

SOURCES OF INFORMATION

Probability of ground water by A. A. Mellary and M. Nakashiro, 1970.

Water samples taken by M. Nakashiro, 1970.

Water samples analyzed by OWRC Laboratory and by M. Nakashiro.

Centre of settlement....

Selected references:

Well information from:

Water-well records on file with the Ontario Water Resources Commission.

Oil and gas well records published by the Petroleum Resources Section of the Ontario Department of Mines and Northern Affairs.

Caley, J. F., 1946, Palaeozoic Geology of the Windsor-Sarnia Area, Ontario; Geological Survey of Canada, Memoir 240.

Caley, J. F., and Sanford, B. V., 1952, Preliminary Maps, Essex County, Ontario; (showing drift-thickness and bedrock contours) Geological Survey of Canada, Paper 52-17.

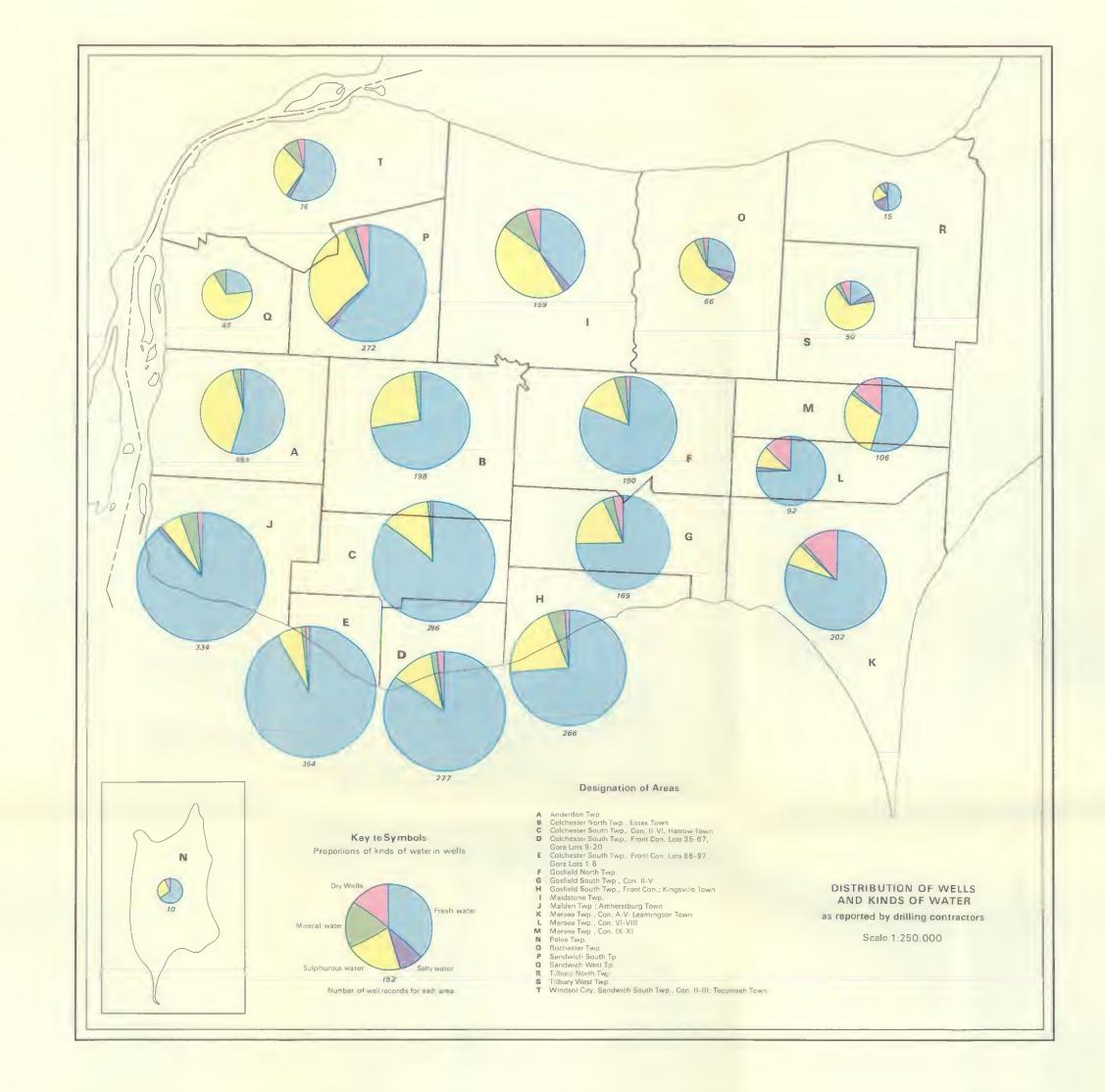
Chapman, L. J. and Putman, D. F., 1966, The Physiography of Southern Ontario; University of Toronto Press.

Richards, N. R., and Caldwell, A. G., and Morwick, F. F., 1949, Soil Survey of Essex County; Report No. 11 of the Ontario Soil Survey.

Sanford, B. V., 1969, Geology, Toronto-Windsor Area, Ontario, Scale 1:250,000, Geological Survey of Canada, Map 1263A.

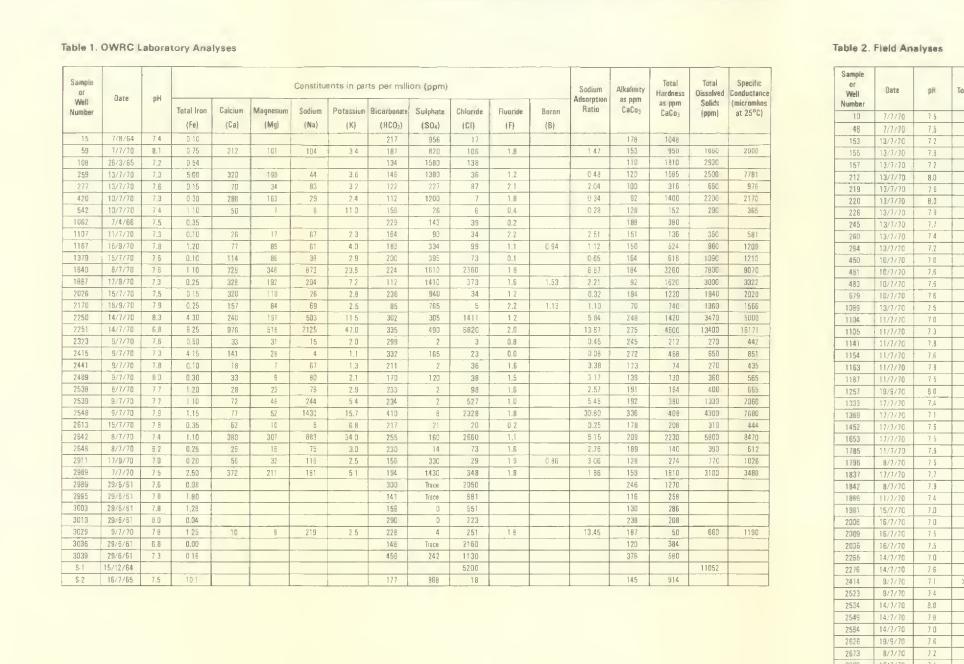
Cartography by R. Zimmermann, 1971.

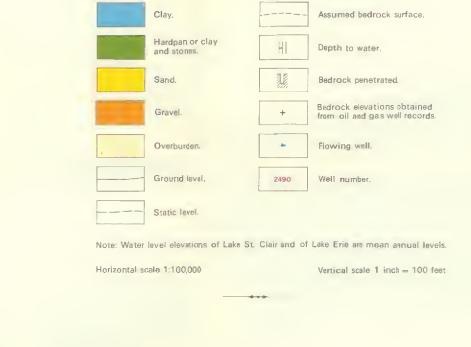
Base map derived from 1:25,000 and 1:50,000 sheets of the National Topographic Series, and from Ontario Department of Highways maps.



CHEMICAL ANALYSES OF WATER SAMPLES

or Date pH Total Iron Chloride Alkalinity Hardness





DESCRIPTIVE NOTES

INTRODUCTION of Windsor, all the towns and some of the sma

The City of Windsor, all the towns and some of the smaller communities in the County of Essex obtain their water supplies from Lake St. Clair, Lake Erie, or the Detroit River. Ground water, despite its secondary role, is the essential supply for all those living outside the serviced areas. These include most farmers and cottagers, particularly those cottagers on the southern shore of the county.

The purpose of this publication is to indicate the probable water yield from wells, the probable depths to the water-yielding formations, areas where shallow wells and sand points may be developed, and the water quality at sampled locations in the County of Essex.

The ground-water probability map was compiled from over three thousand water-well records on file with the Ontario Water Resources Commission, oil- and gas-well data compiled by the Petroleum Resources Section of the Ontario Department of Mines and Northern Affairs, and other information on the ground-water resources of the county. The chemical quality of the ground water was determined by field and laboratory analyses of samples selected to represent the commonly used aquifers and the characteristics of reportedly sulphurous and fresh water wells.

USE OF MAP

A prospective well site can be evaluated by the following steps:

1) Locate the proposed well site on the map.

2) Determine the probable yield by reference to the legend.

3) Note the depth from ground level to the top of the main or most commonly used water-bearing formation.

4) Locate the nearest sampling points and check the analyses listed in tables 1 or 2 to obtain an idea of the probable water quality.

The map is a generalized interpretation of geologic and ground water data. It provides a logical basis for detailed exploration for ground water but does not eliminate the need for such exploration.

Geology

With the exception rock is composed of do the whole county is unlined at the probable water quality.

In the area south of Cedar Creek the bedroof is designated as the Area of the probable water publication.

Probability Ranges

Yields are indicated in four ranges with comments on adequacy of each range:

less than 2 gpm — inadequate to marginal for most purposes.

2-10 gpm — marginal to adequate for domestic or stock purposes.

10-50 gpm — adequate for most commercial, small industry and

farming purposes.

greater than 50 gpm — adequate for most irrigative and many industrial and municipal uses.

An area was placed in a certain probability range if more than 50 per cent of the wells in that area had calculated yields within that range. A well drilled within an area of a particular range may not necessarily produce at a rate within that range, but there is a better than 50 per cent chance that it will. The ranges were determined from reported, short-term pumping tests and may not necessarily represent long-term yields. The determination of yields must still depend on specific investigations.

tigations.

The depth from land surface to the top of the main or most commonly used water-bearing formation is shown using 25-foot contour intervals.

Areas where surface sands or sand layers in the upper portion of the overburden may yield adequate water supplies for household purposes from sand points or bored wells are outlined by hatching. The probable yield, depths and quality shown in these hatched areas are for the deeper water-bearing formations.

The three cross-sections, along lines A₁ - A₄, B₁ - B₂ and C₁ to C₂ show the major overburden materials, depths where water was

the land surface. Water Quality

The results of the water quality analyses in the laboratory and in the field are listed in tables 1 and 2 respectively. The laboratory analyses are more comprehensive; 27 of them were done specifically for this report and 11 are from previous ground water studies. Fifty-four samples were analyzed in the field for five parameters.

Scaled diagrams on the map indicate the locations and the concentration of seven water quality parameters for 26 of the samples that were analyzed for this report.

The majority of the wells sampled (54) were reported by the drillers to be sulphurous. However, the chemical analyses do not show significant difference in the parameters between the reportedly fresh and sulphurous water samples. The percentage of samples with higher sulphate concentrations is somewhat higher among the "sulphurous" wells. The iron concentration in "fresh water" wells seems to be higher than in "sulphurous" wells.

About 25 per cent of the samples had chlorides above the recommended limit of 250 ppm for drinking water. Iron is above the recommended limit of 0.3 ppm in 70 per cent of the samples, The sulphate

concentration exceeds the recommended limit of 250 ppm in 43 per cent of the analyses. Twenty-eight samples were analyzed for fluoride

content and 75 per cent of these were higher than the desirable limit ficient water.

found, static water levels and the depth to the bedrock where the wells

go that deep. They provide a general picture of the nature of the

the whole county is underlain by rocks of Middle Devenian age. In the area south of a line connecting Amherstburg, Harrow and Cedar Creek the bedrock is dark brown limestone and dolomite which is designated as the Amherstburg Formation of the Detroit River Younger, light tan dolomites of the Lucas Formation of the Detroit River Group make up the bedrock in a strip along the Detroit River west of the Essex Terminal Railway from Windsor to Amherstburg and in the areaen compassing Amherstburg, Essex, Leamington, Cedar Creek, The area north of the Lucas Formation and also Pelee Island are underlain by brown limestone of the Dundee Formation of the Hamilton Group, with the exception of the area north of Highway 2, near Lake St. Clair between Windsor and Belle River and the easternmost fringe of the county from the Thames River to County Road 14 where grey shales and limestones of the Hamilton Group form the bedrock. The topography of the county is generally flat. Most of the surface in the vicinity of Harrowand Leamington, and south of Lake St. Clair. A few beach ridges and gravel bars deposited by glacial lakes and a small morainic hill west of Leamington complete the geomorphology of the county. The thickness of the overburden, as disclosed by water-, burg to about 200 feet in Gosfield South Township. Most of the overburden is composed of clay till., In many areas sand and gravel layers are present in the lower part of the overburden, generally overlying the bedrock. Locally, sand layers are found in the middle portion of the overburden but these layers do not seem to have large extents.

permissible limit of 1.0 ppm. The water was found to be very hard

bedrock is generally similar to that of water encountered in the bed-

rock. Intermediate overburden aquifers can have harder water than water from the bedrock. The water from the surficial sands was gener-

Thege neral quality of water as described by water-well contractors

at the time of well construction is shown in the small inset map. The

county was divided into 20 areas to illustrate quality variations. The

number of wells filed with the OWRC for each area is shown, together

fresh water, salty water, sulphurous water, mineral water, or were

North respectively did not yield fresh water as commonly as those in

county. Seventy-three per cent of the wells were reported to yield fresh water, twenty-one per cent sulphurous water, three per cent salty or mineral water and three per cent were dry.

Records for 3,330 wells were on file in 1970 for the whole

With the exception of a small area west of Cometwhere the bed-

rock is composed of dolomite of the Silurian, Bass Island Formation,

simply dry. A quick look at the diagrams reveals that the wells in areas P, O and S in the townships of Sandwich West. Rochester and Tilbury

ally hard but otherwise of good quality.

Occurrence of Water About 80 per cent of the

About 80 per cent of the recorded wells in the County of Essex terminate in the bedrock. The large majority of these wells obtain water from the upper lew feet of the bedrock. Wells that penetrate deep into the rock are generally more common in the Leamington-Harrow area where the bedrock is part of the Detroit River Group. In that area a number of bedrock wells yield plentiful supplies for irrigation; however, in some places the water may be sulphurous.

In the eastern part of the county, a relatively large percentage of wells in the limestone bedrock of the Dundee Formation were dry or had high levels of chemical constituents. In the western and northern part of the county many wells were reported to yield sulphurous and mineralized water from the bedrock of the Dundee Formation and the Hamilton Group.

In a few places, such as a small area west of Mount Carmel, wells yield water from sand and gravel layers in the middle part of the overburden.

wide, extending through the northern parts of Maidstone, Rochester and Tilbury townships, dug wells, ranging from 12 to 30 feet in depth, and cisterns are used. Many farmers have to haul water during prolonged dry seasons. Many wells drilled to or into the bedrock produced water too salty for use. Most of the houses in the northern section are supplied from Lake St. Clair. Although the water yieldfrom dug wells may be insufficient, particularly in the summer time, some of the owners reported they praferred the clear, fresh water from dug wells. Other areas where shallow wells are common are near Harrow and Leamington.

In general, ground water is available in sufficient quantity in most

parts of the county, but the chemical quality in many cases is poorer than that recommended for drinking water. Only three per cent of the

wells drilled in the county were reported to be dry or to have insuf-

In the northern part of Essex County, in a strip about four miles

RESOURCES OF THE PROPERTY OF T

ONTARIO WATER RESOURCES COMMISSION

DIVISION OF WATER RESOURCES

GROUND WATER PROBABILITY MAP

COUNTY OF ESSEX

Scale 1:100,000

1 inch equals 1.58 miles

1 ½ 0 1 2 3 4 5 6

Miles

1 0 1 2 3 4 5 6 7 8 9 10

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